REMARKS

In view of the following discussion, the Applicants submit that none of the claims now pending in the application is anticipated under the provisions of 35 U.S.C. § 102 or made obvious under the provisions of 35 U.S.C. § 103. Thus, the Applicants believe that all of these claims are now in allowable form.

I. RESTRICTION REQUIREMENT

The Applicants hereby affirm the election with traverse made by Kin-Wah Tong on January 14, 2004 to prosecute the invention of Group I, embodied in claims 1-23. Accordingly, claims 24-43 have been provisionally withdrawn.

II. ALLOWABLE SUBJECT MATTER

The Applicants thank the Examiner for his comments regarding the allowability of claims 5, 6, 10, 11, 20, 21 and 23, if rewritten in independent form to include all of the limitations of the base claim and any intervening claims. The Applicants submit, however, that independent claims 1 and 16, from which claims 5, 6, 10, 11, 20, 21 and 23 depend, are allowable as amended. Therefore, claims 5, 6, 10, 11, 20, 21 and 23 are allowable as they stand.

Nevertheless, the Applicants have added new claims 44-51, which present claims 5, 6, 10, 11, 20, 21 and 23, respectively, in independent form as suggested by the Examiner.

III. REJECTION OF CLAIMS 1-4, 9, 12, 16-19 AND 22 UNDER 35 U.S.C. § 102

The Examiner has rejected claims 1-4, 9, 12, 16-19 and 22 in the Office Action as being anticipated by the Ishitani patent (US patent 5,506,918, issued on April 9, 1996, hereinafter Ishitani). In response, the Applicants have amended independent claims 1 and 16, from which claims 2-4, 9, 12-13, 17-19 and 22 depend, in order to more clearly recite aspects of the invention.

Ishitani teaches a document reader device (*e.g.*, a scanner) that is capable of

detecting and compensating for a skew in a document placed on a scanner base. In particular, Ishitani teaches that a document skew detector detects a skew angle of text lines in a region of an input document image. The skew angle information is stored, and a document skew corrector then performs a skew correction or compensation operation for the input document image. That is, Ishitani teaches that a two-dimensional skew of document text image (*e.g.*, due to a rotation of the document) is corrected. The skew-corrected document image is then fed to an optical document reader. Ishitani does not teach that the skew detection and correction technique compensates for three-dimensional distortion of the document image (*e.g.*, due to the text being orientated in a plane that is at an oblique angle to an optical axis of a camera).

The Examiner's attention is directed to the fact that Ishitani fails to disclose or suggest the novel invention of adjusting a detected text region in three dimensions to produce a rectified or corrected image, as claimed in Applicants' independent claims 1 and 16. Specifically, Applicants' claims 1 and 16, as amended, positively recite:

1. Method for recognizing text in a captured imagery, said method comprising the steps of:
(a) detecting a text region in the captured imagery;
(b) adjusting said detected text region in three dimensions to produce a rectified image; and
(c) applying optical character recognition (OCR) processing to said rectified image to recognize the text in the captured imagery. (Emphasis added)

16. Apparatus for recognizing text in a captured imagery, said apparatus comprising:
means for detecting a text region in the captured imagery;
means for adjusting said detected text region in three dimensions to produce a rectified image; and
means for applying optical character recognition (OCR) processing to said rectified image to recognize the text in the captured imagery. (Emphasis added)

Applicants' invention is directed to a method and apparatus for recognizing text in an image sequence of scene imagery, *e.g.*, where the text information is incidental to some other subject being recorded and the position or angle of the text information may therefore render the text difficult to recognize using conventional OCR methods. In

many circumstances, it is desirable to identify incidental text information captured in an imagery (*e.g.*, a three-dimensional scene of the real world), such as a name on a street sign. Conventional text recognition programs and systems typically operate on the assumption that the text lies in a plane that is orientated roughly perpendicular to the optical axis of the camera (*e.g.*, as in the case of a document placed on a scanner). However, in the case of text that is incidental to a main subject being recorded, such as text on street signs, billboards or name plates, the text often lies in a plane that is orientated at an oblique angle, and the text therefore may not be easily or accurately recognized by conventional OCR methods.

The present invention provides a method and apparatus for recognizing text in a captured imagery in which detected text regions are adjusted in three dimensions to account for distortion due to non-perpendicular alignment with an optical axis of a camera recording the imagery. The detected text regions may be both rotated and stretched to produce a rectified (*e.g.*, distortion-compensated) image. These rectified images are then subjected to OCR processing in order to recognize the text contained therein. Thus, by adjusting the text regions in three dimensions, the method can compensate for non-perpendicular text orientation angles, thereby producing a more accurate result.

In contrast, Ishitani teaches a method for detecting and correcting a skew angle of a text in a scanned document by adjusting the text region in two-dimensions, *e.g.*, by rotating the text region to compensate for a rotation of the document from which the text comes. Thus, Ishitani fails to anticipate or make obvious Applicants' invention.

Specifically, Ishitani only teaches the detection and/or correction of skew due to rotation of the original image, *e.g.*, as in the case of a text document which was intended to be read, but which was simply misaligned on a scanner base. The skew correction requires adjustment of the text region in only two dimensions (for example, the text may merely need to be rotated). Ishitani does not address the need to recognize incidental text in a video image, *e.g.*, where the text may be distorted due to a camera angle and can not be read merely by rotating the text region. Ishitani thus fails to teach or make obvious a method of recognizing text in a captured imagery wherein a

detected text region is adjusted "in three dimensions to produce a rectified image", as positively claimed by the Applicants in amended claims 1 and 16. Therefore, the Applicants submit that independent claims 1 and 16, as amended, fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder.

Dependent claims 2-4, 9, 12-13, 17-19 and 22 depend from claims 1 and 16, and recite additional features therefore. As such, and for the exact same reason set forth above, the Applicants submit that claims 2-4, 9, 12-13, 17-19 and 22 are not anticipated by the teachings of Ishitani. Therefore, the Applicants submit that dependent claims 2-4, 9, 12-13, 17-19 and 22 also fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder.

IV. REJECTION OF CLAIMS 13-15 UNDER 35 U.S.C. § 103

The Examiner rejected claims 13-15 under 35 U.S.C. §103(a) as being unpatentable over Ishitani in view the Tyan et al. patent (U.S. Patent No. 6,473,517, issued October 29, 2002, hereinafter Tyan). In response, the Applicants have amended independent claim 1, from which claims 13-15 depend, in order to more clearly recite aspects of the invention. The remainder of the rejection is respectfully traversed.

Ishitani has been discussed above. Tyan teaches a method for segmenting and recognizing a license plate number in an image of a license plate. The image is segmented into suspected character regions, which are subjected to OCR processing and provided with a "confidence score" indicative of the likelihood that the character recognition is accurate. If a character region's confidence score falls below a threshold value, adjacent character regions are "backward merged" into the character region in question to form a combined character region, and the combined character region is then subjected to OCR processing. Backward merging may be done any number of times, until the combined character region is assigned a confidence score that meets or exceeds the threshold value. The backward merge compensates for false segmentation that breaks characters and renders them difficult to recognize. In other words, Tyan teaches that segmented text regions of an image are combined with adjacent text regions from the same single image until an acceptable OCR result is

obtained.

The Examiner's attention is directed to the fact that Ishitani and Tyan (either singly or in any permissible combination) fail to disclose or suggest a method of recognizing text in a captured imagery wherein a detected text region is adjusted "in three dimensions to produce a rectified image", as positively claimed by the Applicants. Applicants' independent claim 1 positively recites:

1. Method for recognizing text in a captured imagery, said method comprising the steps of:
(a) detecting a text region in the captured imagery;
(b) adjusting said detected text region in three dimensions to produce a rectified image; and
(c) applying optical character recognition (OCR) processing to said rectified image to recognize the text in the captured imagery. (Emphasis added)

As recited in the preceding claim, Applicants' invention teaches a method and apparatus for recognizing text captured incidentally within a captured imagery. The method includes the step adjusting a detected text region in three dimensions to produce a rectified image for OCR processing. This approach produces more accurate text recognition results by rotating and stretching the captured text to compensate for three-dimensional distortions due to, for example, camera angle.

In contrast, neither Ishitani nor Tyan teaches or suggests this novel approach. Both Ishitani and Tyan teach methods for recognizing text that assume that the text lies in a plane that is substantially perpendicular to the optical axis of the camera that captured the text image. That is, both Ishitani and Tyan teach to adjust the text region in only two dimensions. Neither Ishitani nor Tyan teaches or suggests adjusting the text region in three dimensions to compensate for distortion due to non-perpendicular camera angle.

Dependent claims 13-15 depend, either directly or indirectly, from claim 1 and recite additional features thereof. As such and for the exact same reasons set forth above, the Applicants submit that claims 13-15 are also not made obvious by the teaching of Ishitani in view of Tyan. Therefore, the Applicants submit that dependent claims 13-15 also fully satisfy the requirements of 35 U.S.C. § 103 and are patentable

thereunder.

Conclusion

Thus, the Applicants submit that all of these claims now fully satisfy the requirements of 35 U.S.C. §102 and §103. Consequently, the Applicants believe that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the issuance of a final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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